

ART. IV.—*Contributions to the Palaeontology of the  
Older Tertiary of Victoria.*

LAMELLIBRANCHS.—PART II.

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(With Plates II. and III.).

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The present paper includes a few interesting species from some of our more important sections, but it is with regret that I am at present unable to include some promised remarks on some of our common Crassatellites and Chiones, there is a good deal of material at present in hand, but I do not yet feel confident enough on certain details to express a definite opinion.

*Ostrea hyotis*, Linnaeus.

1758. *Mytilus hyotis*, Linnaeus. Syst. Nat., ed. 10,  
p. 707.

1899. *Ostrea hyotidoidea*, Tate. T.R.S. S.A., vol. xxiii.,  
pt. ii., p. 268.

*Locality*.—Mornington Clays.

*Observations*.—This shell was originally determined by Professor Tate as *O. hyotis*, Linnaeus, and this identification has evidently been accepted by Mr. Harris, of the British Museum, in his Catalogue of Australasian Tertiary Mollusca (see p. 299), as he remarks that "The general contour of the shell (which, however, is extremely variable in regard to details) is that of the living *O. hyotis*, and it has the characteristic foliaceous scales of that species." Now, Professor Tate, as indicated above, regards our species as distinct, and notes the following points for the distinction: "The fossil species is more depressed, more irregular in outline, the radial ridges less elevated and obtuse, whilst the foliaceous scales very rarely develop into tubular spines." Not having examples of the living species, I am not at present in a position to express a definite opinion.

**Arca capulopsis**, sp. nov. (Pl. II., Figs. 1, 2).

*Description*.—Shell elongate, trapeziform, with a very straight hinge, and a strikingly marked hinge area, umbo somewhat conically elevated obliquely, and forwardly directed towards the anterior end. The hinge area extends the full length of the hinge, and occupies a relatively large space between the hinge and umbo, is slightly concavely excavated towards the umbo, the latter being a little elevated above the hinge line from the internal aspect, the hinge area is smooth but for a number of lineations parallel to the hinge, and is strongly angularly marked off from the remainder of the shell.

Posteriorly the shell is again angularly keeled from the umbo to the extreme extension of the posterior margin, the space between this keel and the angulation of the hinge being rather strongly radially ridged, the number of strong ridges being usually about five, and these are crossed by close lamellae parallel to the lines of growth giving rise to frills. The convexity of the umbo is indented medially, the indentation broadening somewhat towards the distinct sinus in the otherwise slightly convex ventral margin. Anterior margin slightly convex, posterior somewhat obliquely truncated to the hinge line.

Surface ornamented with closely packed radial ridges, all of which do not reach the umbonal region, the short ridges being usually noticeable towards the anterior end, the ridges are crossed by close lamellae parallel to the lines of growth, the latter occasionally showing as more elevated and irregular ridges.

Internally the anterior margin is a little crenulate.

*Dimensions*.—Type specimen, antero-posterior diameter, 10 mm.; dorso-ventral diameter posterior to the umbo, 5 mm.; anterior to the umbo, 3.5 mm. Larger specimens give antero-posterior diameter, 15 mm.; and dorso-ventral, posterior 7 mm., anterior, 5.5 mm.

*Localities*.—Eocene clays of Grice's Creek, Mornington; Type, Eocene clays of Orphanage Hill, Geelong (T. S. Hall); Eocene sandy clays of Corio Bay, Geelong; Miocene sandy clays of Forsyth's section, Grange Burn, probably derived (T. S. Hall).

**Limopsis morningtonensis**, sp. nov. (Plate II., Fig. 6A).

*Description.*—Shell roundly quadrate, depressed, slightly oblique, with a small, but prominent acute and incurved umbo. Hinge line somewhat straight or very slightly curved, being about half as long as the greatest antero-posterior diameter, with a well-marked triangular pit immediately under the umbo, with from 5 to 9 anterior teeth, and 4 to 7 posterior teeth of unequal size, the medial ones of each series being strongest. Anteriorly the shell is shorter than posteriorly, with the margin more convexly rounded; posteriorly there is a tendency to angulation at the junction between the margin and the hinge, and again at the junction with the ventral margin. Occasional specimens show greater posterior obliquity, and a somewhat stronger keel from the umbo to the posterior margin. Internally there is a broad flattened margin, with the concavity finely radially striate. Externally the surface is strongly concentrically ridged, the ridges being of unequal strength, some fine, some broad and flattened; a very close, regular and fine radial striation is noticeable under a lens, though it is not, as a rule, visible to the unaided eye, crossing the concentric ridges.

*Dimensions.*—Type specimen, antero-posterior diameter, 14 mm.; umbo-ventral diameter, 12.5 mm. Other specimens range for the above measurements respectively from 7 mm. by 6.5 mm., 10 mm. by 9 mm., 10 mm. by 10 mm., 13 mm. by 12 mm., up to 18 mm. by 15 mm.

*Localities.*—Eocene clays near old Cement Works, Balcombe's Bay, Mornington, also Grice's Creek. Eocene clays over Polyzoal Rock, Filter Quarries, Batesford; section near Griffin's Farm, Moorabool River; and Orphanage Hill, Geelong. Eocene, Muddy Creek, Western District. Eocene clays of Gellibrand River, coast section below Curdie's Steps (Type). Eocene, Fishing Point, River Aire.

*Observations.*—This shell seems sufficiently distinctive to warrant specific designation, and should be easily separated from our other species. It is possible that this is one of the forms that has been confused with the European shell *Limopsis auritâ*, Brocchi, but there is very little difficulty in making out many important distinctive features. Upon comparison with actual

specimens of the European shell it may be noted that the latter is a thicker, more robust and tumid shell, with a narrower hinge, coarser umbo, and trigonal shape, the hinge characters are also distinct, and the external sculpture gives further evidence for separation.

The present species is somewhat analagous to our very common radially ribbed species, but is not as a rule so oblique in form, and has its concentric ridging as a marked feature of contrast, apart from other details. The late Sir F. McCoy identified the common species of this genus from the lower beds of the Spring Creek section near Geelong, as, without doubt identical, on a comparison of actual specimens from English and German localities, with *Limopsis aurita*, Brocchi, and there is no doubt a very close resemblance in that instance, but I am not yet prepared to make any more definite statement even in this case. The mistake apparently made by Sir F. McCoy, if my interpretation be correct, was in the inclusion of the Mornington fossil as identical with the common Spring Creek form.

***Modiola praerupta*, sp. nov.** (Plate II., Figs. 3, 4).

*Description.*—Shell elongate-oval, markedly tumid, with terminal umbo, and a remarkably steep slope to the ventral margin.

Anterior end narrow, about half the greatest width of the shell, about the middle line strongly convex and rapidly ascending from the anterior margin for a little more than one-third the length of the shell, thence gradually sloping to the posterior margin, spreading out and becoming flattish post-dorsally.

Ventral margin very straight, anterior margin somewhat rounded, dorsal margin straight for a little less than half the length of the shell, thence slightly convexly rounded to the posterior, then more suddenly convex to the ventral margin. Greatest convexity ranging from the umbo obliquely across the shell to about the junction of the posterior and ventral margins, dorsally from this somewhat deeply excavated anteriorly but rapidly shallowing out posteriorly. Surface with fine and very close lines of growth, also with more or less defined undulations

parallel to the lines of growth, the latter being most noticeable posteriorly, fine radial striations are also just discernible in the neighbourhood of the greatest convexity and on the posterior slope.

*Dimensions.*—Antero-posterior diameter, 65 mm.; greatest breadth about 35 mm. from anterior margin, about 30 mm.; thickness through one valve, 16 mm.

*Locality.*—Eocene Septarian Limestones, near the Old Cement Works, Balcombe's Bay, Mornington.

*Observations.*—Only one species of this genus has hitherto been described amongst our fossils, but this by no means fairly represents the actual occurrences. The species at present described is entirely distinct from *M. adelaidensis*, Tate, from the Adelaide bore.

#### *Modiola pueblensis*, sp. nov. (Pl. III., Fig. 1).

*Description.*—Shell of medium size, oval-oblong, somewhat tumid, with very prominent, tumid, and incurved umbo, which projects forwards little short of the narrow, convexly rounded, anterior margin. Ventral margin with a slight sinus situated in front of the median portion of the shell, the sinus rapidly shallowing out in its ascent to the greatest convexity of the shell. Shell excavated posterior to and anterior to the umbo, the greatest convexity is at about the anterior third, and the greatest breadth a little posterior to the median line. The margin posterior to the umbo is straight, and rapidly ascends to the region of greatest breadth, thence the descent is convexly rounded, wedging somewhat posteriorly to join the ventral margin.

The surface is marked by slightly irregular, close, flat ridges, conforming to the growth of the shell, the grooves between being much narrower than the ridges, the growth folds interfering somewhat with the regularity of this sculpture; the ridges are most marked anteriorly tending to be less distinct where the convexity of the shell is greatest.

*Dimensions.*—Type specimen, antero-posterior diameter, 32 mm.; greatest breadth, 17 mm.; breadth at anterior end, about 8 mm.; another specimen, slightly deformed by crushing

but showing both valves in contact, and sufficiently well preserved to give the following: Antero-posterior diameter, 37 mm.; greatest breadth, 18 mm.; greatest thickness through both valves, 16 mm.

*Locality*.—Eocene, lower beds of the Spring Creek or Bird Rock Bluff, near Geelong.

*Observations*.—Apparently closely related to *M. adalaidensis*, Tate, from the Adelaide bore, but differs in relative dimensions, and amongst other features the presence of the ventral sinus, and surface sculpturing serve as features of distinction.

*Leda acuticauda*, sp. nov. (Pl. III., Figs. 4, 4A).

*Description*.—Shell small, ovate-subtrigonal, anterior end convexly rounded and shorter than the posterior, the latter being drawn out into a very acutely pointed end.

Umbo prominent and inflated, apparently smooth, and directed slightly towards the posterior, in paired valves the umbones are in contact. The anterior hinge makes, with the posterior hinge, an angle of about  $104^{\circ}$ , each carrying about twelve to fourteen angular teeth. The posterior hinge line is rather remarkably straight or very slightly concave, while the anterior is slightly convex. Behind the hinge on the posterior slope from the umbo the valve is characteristically flattened, causing a marked posterior keel. Internally the ventral margin is broadly bevelled. The angulation made by the posterior margin with the ventral margin is about  $50^{\circ}$ , but the junction is so pointed as to appear more acute. Externally the valves are very finely concentrically striate, and usually show irregular growth folds.

*Dimensions*.—Type specimen, antero-posterior diameter, 7 mm.; umbo ventral diameter, 4 mm.; thickness through both valves, 3 mm.; other specimens range from this to 6 mm. by 4 mm. down to small young examples which measure 3 mm. by 2 mm.

*Localities*.—Eocene clays of Grice's Creek, and from the clays near the old Cement Works, Balcombe's Bay, Mornington.

*Observations*.—This species might at first sight be mistaken for *L. apiculata*, Tate, but upon examination many points of distinction can be readily made out. The present species has a different hinge angulation, a more marked posterior keel, and

sharper posterior termination, a broader and more marked bevelled margin, and lacks the regular concentric threads which mark the whole of the external surface, forming a characteristic of the abovementioned species. It is also closely related to a fairly abundant species from the Lower Spring Creek beds, near Geelong, but it seems advisable to make distinction between the two, and I therefore include the following particulars on the Spring Creek shell.

***Leda fontinalis*, sp. nov.** (Pl. III., Figs. 3, 3A.)

*Description.*—This species is very similar to the foregoing, and many points in that description apply well to the present form, but the anterior of the shell is not so regularly convexly rounded, having a tendency to be somewhat angled on account of the sudden junction with a very straight ventral margin, and the posterior end of the shell is more acute for the same reason. The valves are deep, so that pairs in conjunction give a very tumid shell for the size; on account of the greater inflation the keeling is more marked and there is a broader flattened area behind the umbones. The hinge teeth are smaller, closer, and slightly more numerous, there being about 15.

Umbones smooth, and earlier portion of the shell with no specially distinct marking, then fairly regular incised concentric grooves, with broad flat spaces between become prominent, with occasional growth folds at irregular distances.

*Dimensions.*—Type specimen, antero-posterior diameter, 6.5 mm.; umbo-ventral diameter, 4 mm.; thickness through both valves, 4 mm.; another specimen of the same size shows slightly less inflation, being a little under the 4 mm. in thickness; other examples range in their diameters, 6 mm. by 3.5 mm., 5½ mm. by 3.5 mm., and 4.5 m.m. by 3 mm.

*Locality.*—Eocene, lower beds of the Spring Creek or Bird Rock Bluff Section, near Geelong.

*Observations.*—This is probably the species referred to under the manuscript name of *L. embolos*, by Professor Tate.

***Carditella regularis*, sp. nov.** (Pl. II., Fig. 5).

*Description.*—Shell small, rotund, and convex, with prominent incurved anteriorly directed umbo, and a small but well-defined

deeply excavated lunule. Umbo convexly rounded, and running out to an acute point just above the cardinal area. Outline of the shell very regularly rounded, but for the slight interruption in the neighbourhood of the lunule. Inner margin crenulated from the lower margin of the lunule to the posterior end of the hinge in accordance with the external radial ridges. External surface sculptured with fine close radial ridges, the interspaces being narrower than the ridges, but widest on the posterior slope, and widening towards the margin; ridges number about 28 to 30, and are very regularly and finely beaded, the beads being more rounded in the neighborhood of the umbo, then becoming more oval, and then more oblong towards the ventral margin. Interspaces apparently smooth, but under a good lens show fine concentric markings.

*Dimensions.*—Antero-posterior diameter, 5 mm.; umbo-ventral diameter, 5 mm.; thickness through one valve, about 2 mm.

*Localities.*—Type from the Eocene clays of Grice's Creek; also from the clays near the Old Cement Works, Balcombe's Bay, Mornington.

*Observations.*—The present form appears entirely distinct from any of the five species of this genus already described by Professor Tate, and may be said at first sight to somewhat recall *Cardita delicatula*, Tate, but its hinge characters are exactly those of *Carditella*, and at the same time it is smaller on the average, more rotund, more convex, and with finer sculpture, than that species.

### *Modiolaria balcombei*, sp. nov. (Pl. III., Fig. 2).

*Description.*—Shell small, oblong-oval, very tumid, especially at the umbo and about the umbonal ridge, maximum convexity about the median portion of the shell, thin and nacreous internally.

Umbo very prominent, strongly incurved, and terminal; anterior margin only slightly convex to the ventral margin; the latter showing a distinct sinus, dorsally the margin is convexly rounded, inclined to angulation with the posterior margin, on account of oblique truncation, and again, slightly angled where the umbonal ridge runs out. The whole of the inner margin



finely crenulated. The embryonic shell is well marked, apparently smooth and shining, though very small; the remainder of the shell is finely radially ridged, the ridges being very close, and, as a rule, broader than the intervening spaces, as the shell increases in size fresh ridges make their appearance in the interspaces, at first only thin, but soon reaching the dimensions of the others, so that marginally the ridges are much more numerous; the radial ridges are crossed by concentric growth lamellae, giving rise to a more or less regular cancellation.

*Dimensions.*—Type, greatest length, 5 mm.; greatest breadth, a little over 3 mm.; greatest convexity, about 2 mm. Other examples give about the same dimensions, save that in some the breadth is a good 3.5 mm.; smaller examples range, length, 3 mm.; breadth, 2 m.m.

*Locality.*—Eocene clays from the Old Cement Works, Balcombe's Bay, Mornington.

*Observations.*—Apparently this species is somewhat related to *Modiolaria corioensis*, Tate, but may be distinguished by being more tumid, and differently sculptured.

#### *Verticordia excavata*, sp. nov.

*Description.*—Shell small, thin, oblong-ovate, with a prominent produced anterior, umbo prominent and incurved anteriorly a little short of the hinge. Shell only slightly convex, somewhat depressed towards the ventral margin, also to the anterior and posterior; deeply excavated immediately in front of the umbo, giving rise to a distinct lunule. Inner margin of valve delicately crenulated, and interior of shell nacreous, with a relatively large anterior adductor muscular impression. Externally the surface is sculptured by narrow acutely angular radial ridges, the interspaces being about twice as broad as the ridges, and very finely transversely striate, ridges number about twenty-eight, and their crests are extremely finely and closely lamellose transversely, the latter feature being most noticeable on the anterior slope, the lamellae apparently being erect.

*Dimensions.*—Antero-posterior diameter, 6 mm.; umbo-ventral diameter, 5 mm. (incomplete).

*Locality.*—Eocene clays from near the old Cement Works, Balcombe's Bay, Mornington.

